

# Keeping the Air Clean and Safe—An Anthrax Smoke Detector

## Originating Technology/ NASA Contribution

Scientists at work in the Planetary Protection division at NASA's Jet Propulsion Laboratory (JPL) sterilize everything before blasting it to the Red Planet. They take great pains to ensure that all spacecraft are void of bacterial life, especially the microscopic bacteria that can live hundreds of years in their spore states. No one is quite sure what Earthly

germs would do on Mars, but scientists agree that it is safest to keep the Martian terrain as undisturbed as possible. Errant Earth germs would also render useless the instruments placed on exploration rovers to look for signs of life, as the life that they registered would be life that came with them from Earth.

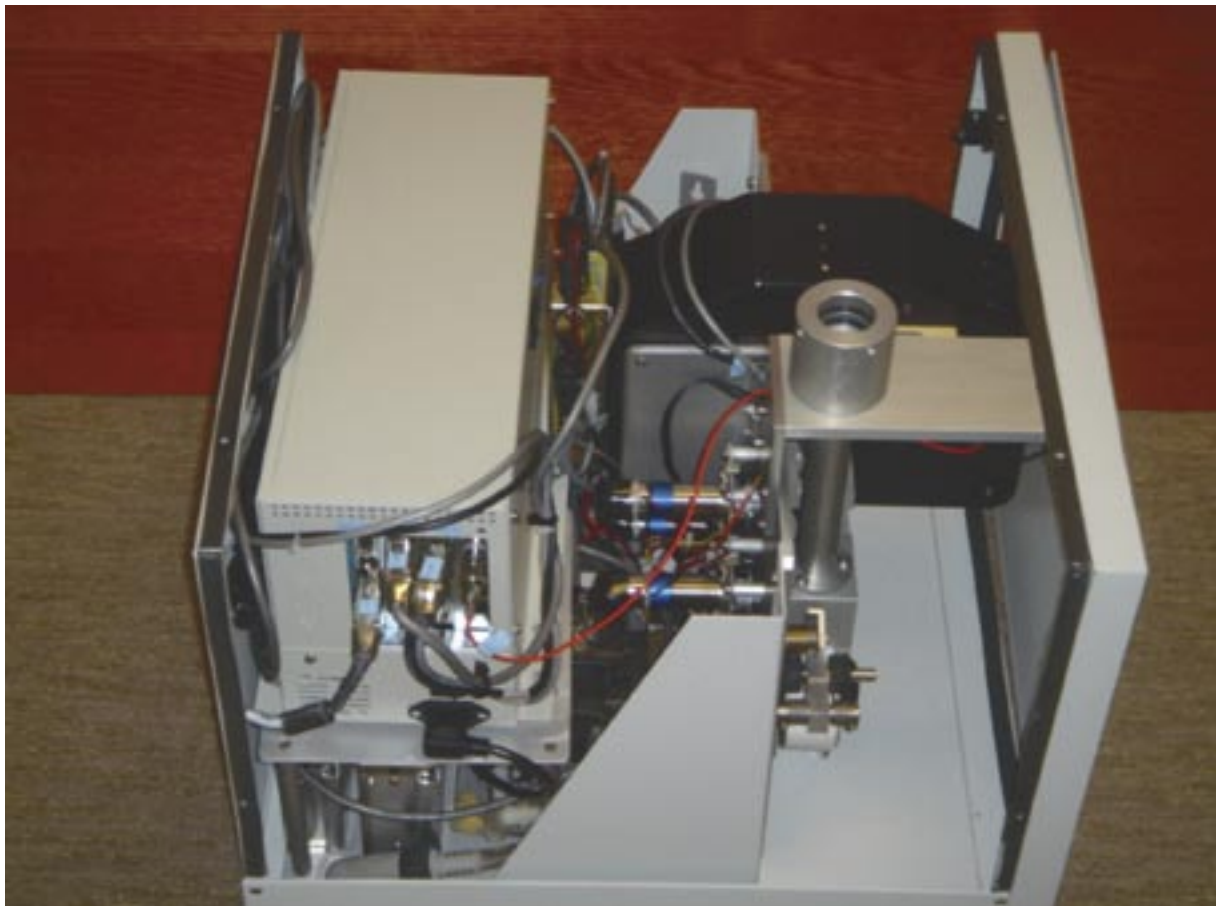
A team at JPL, headed by Dr. Adrian Ponce, developed a bacterial spore-detection system that uses a simple and robust chemical reaction that visually alerts Planetary Protection crews. It is a simple air filter that traps

micron-sized bacterial spores and then submits them to the chemical reaction. When the solution is then viewed under an ultraviolet light, the mixture will glow green if it is contaminated by bacteria. Scientists can then return to the scrubbing and cleaning stages of the sterilization process to remove these harmful bacteria.

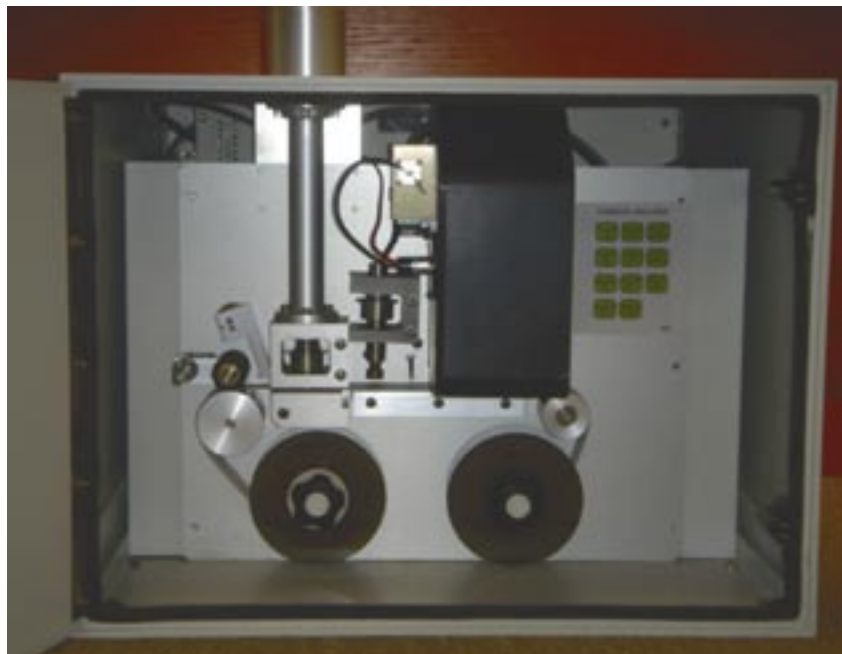
The detection system is the space-bound equivalent of having your hands checked for cleanliness before being allowed to the table; and although intended to keep terrestrial germs from space, this technology has awesome applications here on Mother Earth. The bacterial spore-detection unit can recognize anthrax and other harmful, spore-forming bacteria and alert people of the impending danger.

As evidenced in the anthrax mailings of fall 2001 in the United States, the first sign of anthrax exposure was when people experienced flu-like symptoms, which unfortunately, can take as much as a week to develop after contamination. Anthrax cost 5 people their lives and infected 19 others; and the threat of bioterrorism became a routine concern, with new threats popping up nearly everyday. The attacks threatened the safety that so many Americans took for granted, as the very air that people breathed became suspect. Any building with a circulation system, where large groups congregate, was now a potential target.

Ponce recognized a need for the application of his device and the timely terrestrial uses for this technology. "What we needed," he said, "was an automated air monitor that could warn us of an anthrax attack, much like a smoke detector warns us of a fire. This is exactly what we developed at JPL."



Universal Detection Technology's bacterial spore detection system, the BSM-2000, is simple and robust, prerequisites for continuous monitoring of the air.



The BSM-2000 is portable. The average unit is just about the size of a computer terminal and weighs less than 50 pounds.

## Partnership

Realizing the enormous potential that the so-called anthrax “smoke” detector (ASD) held, NASA determined that the JPL venture could benefit from a commercial partner to speed this life-saving tool to market, where it could best help people.

The connection happened at a meeting on bioterrorism, hosted by the U.S. National Institutes of Health, where Greg Bearman, a scientist at JPL who worked with Ponce on the bacteria-testing devices and is active in JPL’s Technology Transfer Program, happened to be seated next to Jacques Tizabi, president and CEO of [Universal Detection Technology](#) (UDT). In the air-sampling market for over 30 years, UDT found previous success with its monitors for ozone, nitrogen oxides, sulfur dioxide, and other pollutants. After a brief conversation, it was clear that the ASD was a perfect fit for the plans

UDT had to improve its line of detection devices.

In August 2002, just months after the anthrax attacks shook the country, UDT partnered with JPL through NASA’s Innovative Partnerships Program; and through the California Institute of Technology, it gained exclusive rights to option the ASD for worldwide use. This

agreement also enabled UDT to leverage the expertise of JPL researchers, as they developed their bacterial spore-detection technology for integration into UDT’s bioterrorism-detection device, and thus, significantly accelerated the development and deployment of UDT’s bacterial spore monitor, the BSM-2000.

Ponce saw great potential for this commercialization of NASA technology. He commented, “I see this technology being used in any large public space, possibly working in concert with other detection technologies to provide complete coverage of potential attacks with pathogens.”

## Product Outcome

Since UDT has the exclusive option on all intellectual property related to the development of the ASD, it has made great strides to get the BSM-2000 on the market.

The unit operates on fairly simple principles. It combines a bioaerosol capture device with a simple analysis

method, a robust chemical test for bacterial spores. Airborne particles are drawn to the machine through a fan, captured, and then tested for weaponized anthrax. In addition to its simplicity, the unit has a host of other benefits. It is a long-term solution that runs continuously with little maintenance. It requires very little in the way of operating costs, and has a high reliability factor, with low susceptibility to false alarms.

It is portable. The average unit is just about the size of a computer terminal and weighs less than 50 pounds. The unit consists of an air sampler, a continuous glass fiber tape for capturing spores, a motorized heating element to lyse spores, a syringe pump to deliver the reagent, and a spectrometer to detect luminescence.

UDT has already sold these units around the world. Sartec Saras Technologie is its exclusive Italian distributor. Quantum Automation handles distribution for Singapore, Malaysia, and Thailand. On the home front, Securewrap is making plans to install the monitor at its facility at the Miami International Airport, one of the busiest in the country and a major hub of international cargo shipments.

UDT is working with major hotels, Las Vegas casinos, and convention centers. The company is also in discussions with the U.S. State Department to get the BSM-2000 into mail rooms at embassies overseas and has presented the technology to the United States Postal Service. The unit also has great potential for use in train stations, shopping malls, sports arenas, and any place where large groups of people gather.

Soon, the units will be spread all over the world and working as an effective first step in the detection of biological attacks. If the monitor is activated, and there is an anthrax attack, authorities will know within minutes, not days, and lives will doubtless be saved. Authorities can prevent the sicknesses, deaths, and disasters, rather than having to respond to them. ❖